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## Could there be life on Enceladus?

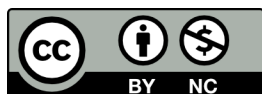
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Hamp, Rachael (2020). Could there be life on Enceladus? Postgraduate Research Poster Competition, The Open University.

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# Could there be life on Enceladus?

By Rachael E. Hamp

Saturn with its rings. Enceladus is present within the outer 'E-ring'. Credit: NASA/JPL-Caltech/Space Science Institute

## What is Enceladus?

- **A moon of Saturn**
  - ~500 km in diameter
- **Has an icy exterior**
  - global ocean under the surface
- **Plumes on the South Pole**
  - throw water into space, sampled by Spacecraft

This is one of the most likely place to find life beyond Earth

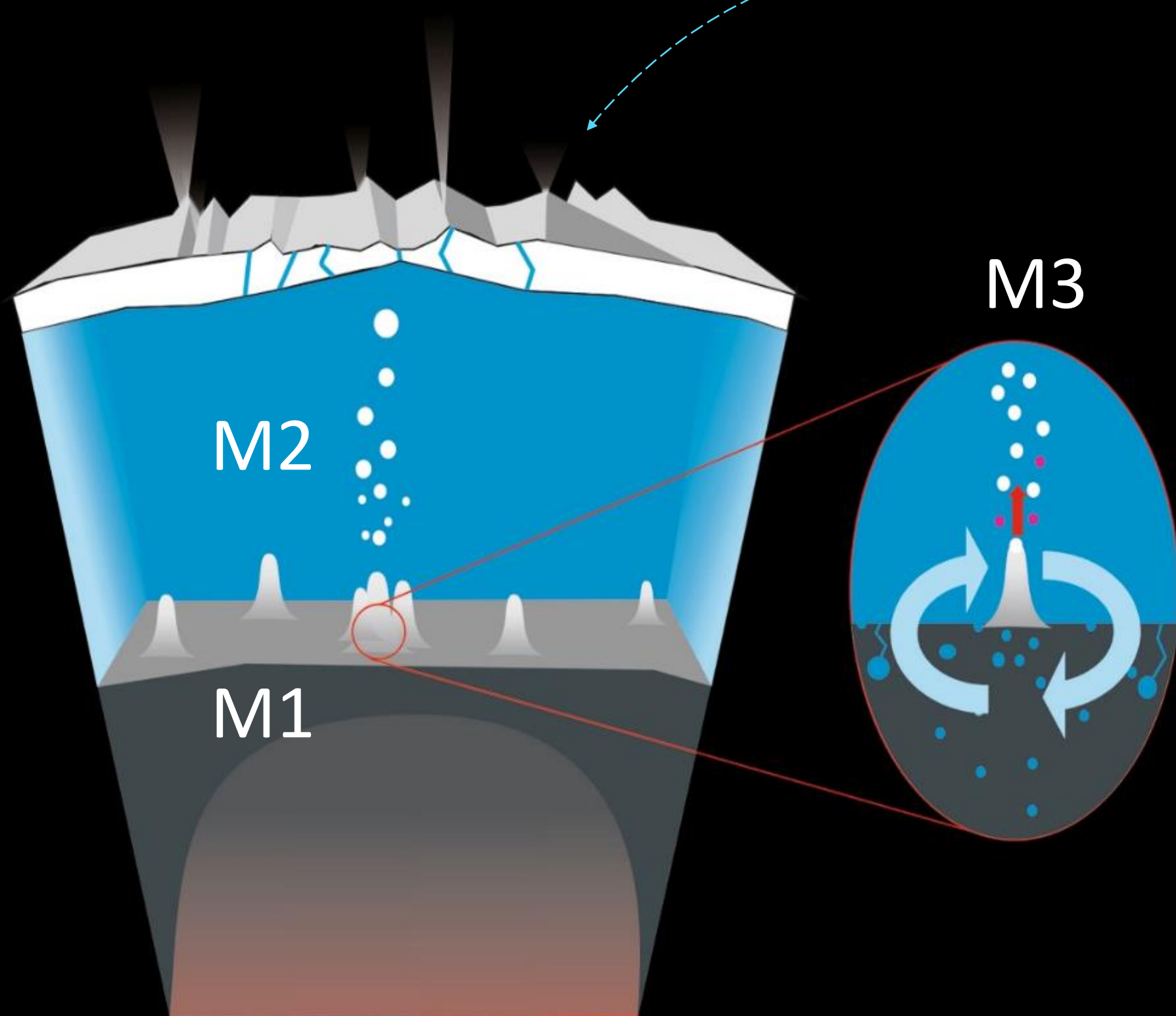
## What life needs?

- **Liquid water**
  - in the subsurface ocean
- **Elements for life**
  - carbon, nitrogen and hydrogen detected
- **Energy**
  - hydrothermal vents (hot vents on the ocean floor)

Life on Earth may have arisen in similar hydrothermal systems

Above Left: An enhanced colour image of Enceladus from the Cassini spacecraft showing the south polar plumes. Credit: NASA/JPL-Caltech/Space Science Institute

## My PhD – Carbon cycling on Enceladus



This expanded cross section view of the South Pole of Enceladus shows the areas I am studying; where water and rock interact. M1, M2 and M3 correspond to each of the method steps of my project.

### Aims of project

- Study the interactions on Enceladus between the rock and the ocean
- Define a carbon cycle for the subsurface environment of Enceladus

Hypothesis: Enceladus has water, energy and essential elements – could it host life?

### Methods

1. Make a chemical simulant to represent the rocky interior of Enceladus (M1)
2. Model the composition of the subsurface ocean (M2)
3. Simulate reactions between simulant and subsurface ocean (M3)

## Preliminary results

- There is a variety of **carbon molecules** in Enceladus (carbon dioxide, methane and hydrocarbons)
- My modelling suggests other elements essential for life such as **sulfur** are present
- Many of these molecules are used or produced through **biological processes**

So far my research supports Enceladus as a potential place to host life!